

Name: \_\_\_\_\_

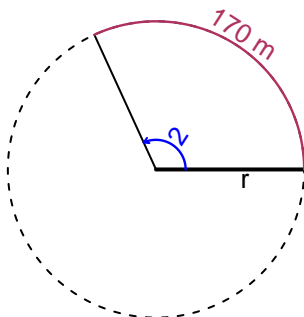
Date: \_\_\_\_\_

## Trig Final (Solution v0)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2 radians. The arc length is 170 meters. How long is the radius in meters?

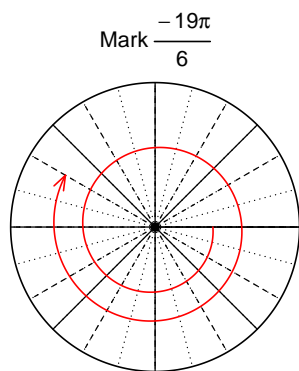


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 85$  meters.

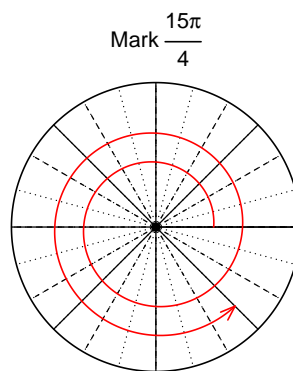
### Question 2

Consider angles  $-\frac{19\pi}{6}$  and  $\frac{15\pi}{4}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(-\frac{19\pi}{6}\right)$  and  $\sin\left(\frac{15\pi}{4}\right)$  by using a unit circle (provided separately).



Find  $\cos(-19\pi/6)$

$$\cos(-19\pi/6) = \frac{-\sqrt{3}}{2}$$



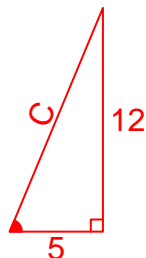
Find  $\sin(15\pi/4)$

$$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$$

### Question 3

If  $\tan(\theta) = \frac{-12}{5}$ , and  $\theta$  is in quadrant II, determine an exact value for  $\sin(\theta)$ .

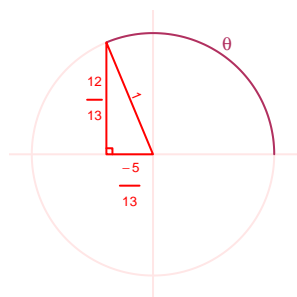
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}5^2 + 12^2 &= C^2 \\ C &= \sqrt{5^2 + 12^2} \\ C &= 13\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{12}{13}$$

### Question 4

A mass-spring system oscillates vertically with an amplitude of 7.02 meters, a midline at  $y = -4.66$  meters, and a frequency of 8.94 Hz. At  $t = 0$ , the mass is at the midline and moving down. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = -7.02 \sin(2\pi 8.94t) - 4.66$$

or

$$y = -7.02 \sin(17.88\pi t) - 4.66$$

or

$$y = -7.02 \sin(56.17t) - 4.66$$